Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 1, 2, 22, 24, 27, 90 and 95 of the Commission's Rules to Improve Wireless Coverage Through the Use of Signal Boosters	)	WT Docket No. 10-4

REPLY COMMENTS OF NEXTIVITY, INC.

Nextivity, Inc. ("Nextivity"), by its undersigned counsel, hereby submits these reply comments in the above-captioned proceeding regarding the elimination of the "personal use" restriction for the operation of Wideband Signal Boosters. In a recent filing, Nextivity discussed the public record that has been developed regarding the significant benefits of enabling *Provider-Specific* consumer signal boosters to operate without the constraints of the "personal use" restriction and the unanimous support for eliminating this requirement.[1] With a complete public record showing no technical or other rationale for the "personal use" restriction for Provider-Specific boosters, the rule stands only as an unnecessary barrier to small businesses, enterprises, public institutions, public safety responders, and others from taking advantage of this important wireless coverage solution, and stymies further innovation in this sector. For these reasons, the Commission is poised to eliminate the personal use restriction for Provider specific boosters and should expeditiously proceed in doing so.

[1] *Ex Parte* Letter from Nextivity, Inc. to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-4 (filed Mar. 22, 2017) ("Nextivity *Ex Parte*").

Several parties expressed support for Wilson's Petition for Rulemaking to eliminate the "personal use restriction" for Wideband boosters.[2] Nearly all reiterated the importance and public benefits of signal boosters, especially for small businesses,[3] and favor regulatory requirements that protect against interference without significant cost.[4] As expressed in its March 22 filing,[5] Nextivity does not oppose Wilson's petition but urges the Commission to take steps in any rulemaking proceeding that may be initiated in response to Wilson's petition to consider several specific technical concerns that apply to Wideband boosters operating in an enterprise environment. Wideband boosters employ a different technology with different operational features and challenges and are subject to different technical and regulatory requirements.

At the outset, Nextivity rejects the suggestion that this note of caution with respect to Wideband boosters is "anti-competitive."[6] As a leading innovator in the signal booster market, Nextivity welcomes robust competition based on technology innovation, performance and cost-efficiencies. As a significant investor in R&D in this area, Nextivity's technical team continues

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[2] All parties also took the opportunity to support removal of the restriction for Provider-Specific boosters. *See*, *e.g.*, Comments of the Enterprise Wireless Alliance, WT Docket No. 10-4, RM-11784 (filed Mar. 23, 2017); Comments of T-Mobile USA, Inc., WT Docket No. 10-4 (filed Mar. 23, 2017); Comments of the Telecommunications Industry Association, WT Docket No. 10-4 (filed Mar. 23, 2017); Comments of SureCall, WT Docket No. 10-4 (filed Mar. 23, 2017); Comments of Sprint Corporation, WT Docket No. 10-4 (filed Mar. 22, 2017).

[3] *See Ex Parte* Letter from the Independent Community Bankers of America to Marlene H. Dortch, Secretary, FCC, WT Docket No. 10-4 (filed Mar 23, 2017).

[4] Comments of United Parcel Service, Inc., WT Docket No. 10-4 (filed Mar. 23, 2017).

[5] Nextivity *Ex Parte*, *supra* n.1.

[6] *See* Comments of Staircase 3, Inc., d/b/a RepeaterStore and RSRF, WT Docket No. 10-4 (filed Mar. 24, 2017) at 2 ("Staircase3 Comments").

to explore a variety of technology paths and the different challenges they present. Accordingly, Nextivity recommends a dispassionate review of the technical and operational issues identified with respect to Wideband booster operation in an enterprise environment in the process of any rule change. Signal boosters can be a cost-efficient coverage solution that poses no risk to wireless networks or consumer services. Nextivity is strongly opposed to rule changes that would in any way erode the current confidence of wireless providers and the public in the deployment of signal boosters.

Nextivity specifically urged the Commission in its March 22 filing to examine the interference and network management concerns relevant to the operation of Wideband boosters without the "personal use" restriction in an enterprise environment, and adopt any necessary requirements to ensure that Wideband boosters installed by consumers without professional installation in a business environment will not cause harm to carrier networks.[7] The Part 20 rules were designed so that Wideband consumer signal boosters that comply with the rules could be deployed without the specific support of wireless providers or professional installers, and the technical and operational issues for Wideband boosters deployed under a different model should be examined. In particular, unlike Provider-Specific boosters, Wideband boosters are not required to coordinate closely with wireless carriers. Therefore, where Wideband boosters are deployed, carriers have no means to manage network capacity to traffic demands in order to avoid performance degradation.[8] Further, unlike Provider-Specific boosters, Wideband boosters deployed in an enterprise environment run the risk of intermodulation interference in the

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[7] *See* Nextivity *Ex Parte*.

[8] Nextivity *Ex Parte* at 5.

downlink path. The potential for technical harm and proposed solutions should be considered in any rulemaking initiated.[9]

A number of the parties filing comments are resellers and systems installers that are currently offering the professional installation services necessary to install Wideband boosters "correctly."[10] The rule changes proposed by Wilson, however, would enable consumers to install Wideband boosters in any application and any environment. The rules would enable a "plug and play" approach with no professional installation or wireless carrier involvement. As described in Nextivity's March 22 filing, this scenario raises the real possibility that consumers will install Wideband boosters incorrectly or in inappropriate situations and cause unmanaged capacity demand in parts of the network and/or intermodulation interference, both of which may result in degraded service.

The impact of capacity demands on network performance is well-documented and should not be overlooked.[11] Increasing the number of users on a cell base station will result in a e

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[9] Testing on Part 20-compliant Wideband consumer signal booster illustrates that significant interference levels can be present on the downlink output of a wideband signal booster if, for example, two LTE calls are being boosted by the signal booster in the uplink direction. *See* Nextivity *Ex Parte* Appendix A (detailing test results demonstration intermodulation interference generated in the case of a wideband boosters).

[10] *See, e.g.*, StairCase3 Comments; Comments of Sadriddin Currimbhoy, CEO, SignalBoosters.com, WT Docket No. 10-4 (filed Mar. 23, 2017); Comments of Steve Klingensmith, RCS Wireless Technology, WT Docket No. 10-4 (filed Mar. 21, 2017).

[11] *See, e.g.*, Francesco Capozzi *et al.*, *Downlink Packet Scheduling in LTE Cellular Networks: Key Design Issues and a Survey*, 15 IEEE COMMUN. SURVEYS & TUTORIALS 2, pp. 678-699 (Second Quarter 2013) (examining resource allocation issues in future generation cellular network systems including the tension between spectral efficiency and fairness); ("*Capozzi*"); Tolga Girici *et al.*, *Proportional Fair Scheduling Algorithm in OFDMA-Based Wireless Systems with QoS Constraints*, 12 J. COMMUN. & NETWORKS 1, pp. 30-42 (February 2010) (discussing difficulties in allocating resources in wireless networks and difficulties balancing fairness of long-term data rates and quality of service) ("*Girici*"); FP7 ICT-Socrates, *Load Balancing in Downlink LTE Self-Optimizing Networks*, presented at VTC 2010

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degradation in user experience if the number of users crosses a technology and environment-dependent threshold.[12] This issue, and any proposed solutions, must be considered in any rulemaking initiated in response to the Wilson petition.

Similarly, with respect to intermodulation interference, any rulemaking proceeding initiated should consider: (1) the extent to which and in what circumstances users relying on a Wideband signal booster deployed in the enterprise environment will suffer from significant degradation of service; and (2) what, if any, requirements should be adopted to address such interference. Intermodulation interference can be present on the downlink output of a wideband signal booster if, for example, two LTE calls are being boosted by the signal booster in the uplink direction.[13]

The Part 20 rules intermodulation standard differs from the near universally accepted 3GPP standard. Operators across the globe, including some of the major North American

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Spring, Taipei, Taiwan (May 19, 2010), *available at* http://www.fp7-socrates.eu/files/Presentations/SOCRATES_2010_VTCSpring%20%20LB%20presentation.pdf (presenting issues caused by and solutions for load balancing, a common problem in communication networks wherein users cannot be served with required quality level due to lack of resources caused by excessive traffic) ("*Socrates*").

[12] Capozzi, Girici, and Socrates all demonstrate that the rate at which the performance metrics degrade is faster than the number of users added into the system. For example, the studies in Girici analyze video outage percentage as a function of the number of users; here, rapid degradation occurs after 120 users. *Girici* at 38-40. Similarly, the studies in Caprozzi show significant decrease in average user throughput for increased numbers of users; and the studies in Socrates document increased unsatisfied users due to resource limitations. *Caprozzi* at 689; *Socrates* at 7. These results are grounded in the fundamental nature of networks and confirm that giving a "blank check" to consumer installers of Wideband boosters is highly likely to manifest as poor user experiences at some point as networks become more and more loaded.

[13] *See* Nextivity *Ex Parte* Appendix A.

operators, look to the 3GPP standard to set a baseline for system performance. Provider-Specific boosters are often asked to comply with 3GPP standards in addition to Part 20 requirements in order to obtain approvals from wireless carriers. While Nextivity cannot speak for wireless license holders, the company's experience with more than 180 different mobile network operators across the globe has demonstrated that they do this to ensure that their network planning will in no way be affected by the boosters used on their networks. The 3GPP standards represent the collective experience and knowledge of the global cellular engineering industry.[14] The Commission should consider the impact of adopting amended Part 20 rules that would significantly depart for internationally agreed-upon norms.

As a leading innovator in signal booster technology, Nextivity shares the Commission's twin goals to ensure that FCC rules permit the deployment of only high quality, booster technology proven to cause no harm to wireless carrier networks while enabling users to benefit from these important wireless coverage solutions to address current and growing needs. To these ends, Nextivity urges the Commission to: (1) resolve the long-pending rulemaking proceeding in this docket by immediately issuing an order eliminating the "personal use" restriction for Provider-Specific Consumer Signal boosters; and (2) if the Commission decides to proceed with considering elimination of this restriction for *Wideband* boosters, a completely

[14] In the case of intermodulation performance, it is instructive to note that the 3GPP standard defines a very specific limit for input intermodulation. Specifically, the 3GPP standard requires that the output power of a booster may not rise by more than 10 dB over the output of the booster with no input in the presence of an IM term. *See* 3GPP 36.106 sec 11.1.1). This is in sharp contrast with the -19 dBm IM term allowed by the Part 20 rules. Furthermore, the Part 20 rule uses two very closely spaced tones (600 kHz apart) which is much different from the scenario one would have with two active LTE transmissions for example. Clearly, the issue of intermodulation interference is dealt with much less stringently in the FCC rules compared to the 3GPP standard that has, in addition to the Input Intermodulation standard already cited, additional standards for Output Intermodulation. *See* 3GPP 26.106, sec. 12.

different class of booster devices presenting different technical and operational risks to wireless networks, the Commission should do so in a separate rulemaking in which potential technical harm issues, including impact on interference and network capacity, and any appropriate testing, can be fully considered.

Respectfully submitted,

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